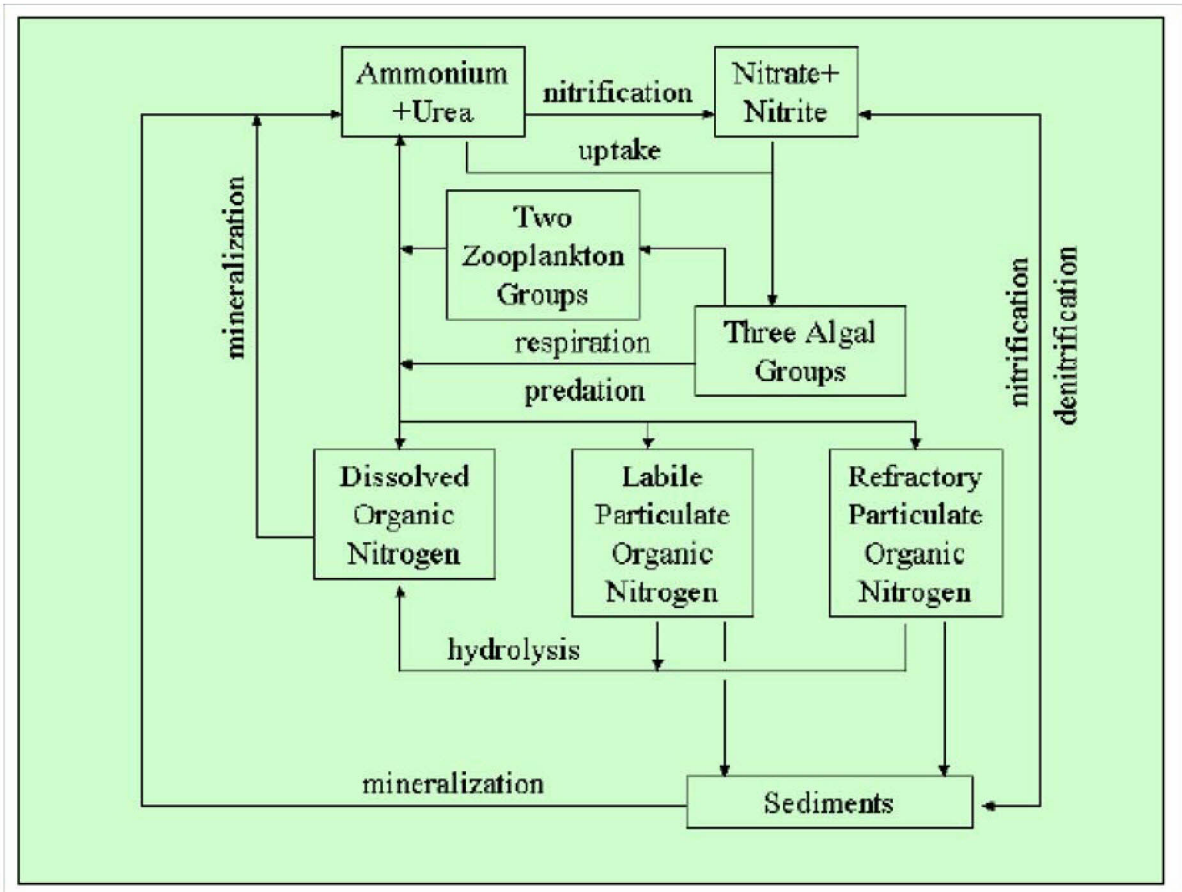
Appendix A: Structure and Equations of Organic Nitrogen Simulation in the Water Quality and Sediment Transport Model

From:

Cerco, Carl F.; Noel, Mark R., 2004. The 2002 Chesapeake Bay Eutrophication Model July 2004. U.S. EPA Chesapeake Bay Program Office, pp:349 Annapolis, MD

The structure of the organic nitrogen simulation in the Water Quality and Sediment Transport Model is shown in the following figure. The forms of the equations governing the organic nitrogen state variables follow.



Dissolved Organic Nitrogen

$$\frac{\delta}{\delta t} DON = ANC \bullet (BM \bullet B \bullet FND + PR \bullet FNDP) + Klpon \bullet LPON + Krpon \bullet RPON - Kdon \bullet DON$$

in which:
DON = dissolved organic nitrogen (g N m^{-3})
ANC = nitrogen to carbon ratio of algae
BM = basal metabolic rate of algae at reference temperature Tr
B = algal biomass expressed as carbon
PR = predation
LPON = labile particulate organic nitrogen (g N m^{-3})
RPON = refractory particulate organic nitrogen (g N m^{-3})
FND = fraction of algal metabolism released as DON ($0 < FND < 1$)
FNDP = fraction of predation on algae released as DON ($0 < FNDP < 1$)
Klpon = hydrolysis rate of LPON (d^{-1})
Krpon = hydrolysis rate of RPON (d^{-1})
Kdon = mineralization rate of DON (d^{-1})

Labile Particulate Organic Nitrogen

$$\frac{\delta}{\delta t} LPON = ANC \bullet (BM \bullet B \bullet FNL + PR \bullet FNLP) - Klpon \bullet LPON - Wl \bullet \frac{\delta}{\delta z} LPON$$

in which:
FNL = fraction of algal metabolism released as LPON ($0 < FNL < 1$)
FNLP = fraction of predation on algae released as LPON ($0 < FNLP < 1$)

Refractory Particulate Organic Nitrogen

$$\frac{\delta}{\delta t} RPON = ANC \bullet (BM \bullet B \bullet FPR + PR \bullet FPRN) - Krpon \bullet RPON - Wr \bullet \frac{\delta}{\delta z} RPON$$

in which:
FNR = fraction of algal metabolism released as RPON ($0 < FNR < 1$)
FNRP = fraction of predation on algae released as RPON ($0 < FNRP < 1$)